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(54) FLAME-RETARDANT FOR STYRENIC RESIN

(57)Abstract:

PURPOSE: To obtain a flame-retardant for styrenic resin providing molded and processed articles having excellent flame retardance, mechanical characteristics and appearance and high commercial value because of excellent compatibility with a styrenic resin and excellent heat resistance.

CONSTITUTION: This flame-retardant for styrenic resin comprises 10-90wt.% of a brominated polystyrene or a brominated styrene maleic anhydride copolymer having 600-30,000 weight-average molecular weight and a brominated polystyrene having 100,000-300,000 weight-average molecular weight.

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100microl after dissolving 0.1g of samples in tetrahydrofuran 100ml. It poured into the TOSOH CCPM system and the weight average molecular weight of standard polystyrene conversion was calculated using the data processor by the obtained chromatograph. The analysis conditions are as follows. A column (TOSOH make TSK-Gel G4000Hx1x1, G3000 Hx1x1, G2000Hx1x2 4 connection), a mobile phase (tetrahydrofuran), the rate of flow (1.0 ml/min), column temperature (40 degrees C), detection wavelength (UV254nm).

Bromine content: JIS K It measured by the approach according to 7299 (flask combustion method).  
TG (thermogravimetric analysis): Differential-calorimetry equipment (Rigaku make) was used and measurement from a room temperature to 700 degrees C was performed with 10-degree-C programming rate for /among the air ambient atmosphere.

[0018] (Example 2) In the example 1, bromination polystyrene 420g was obtained by the same approach instead of the polystyrene of weight average molecular weight 730 except having used the polystyrene of weight average molecular weight 10,000 (61 degrees C of glass transition points). The weight average molecular weight of the obtained bromination polystyrene, bromine content, and the measurement result of TG are shown in Table 1.

[0019] (Example 3) In the example 1, bromination polystyrene 423g was obtained by the same approach instead of the polystyrene of weight average molecular weight 730 except having used the polystyrene ( diamond REXX made from the Mitsubishi Kasei poly tex) of weight average molecular weight 160,000. The weight average molecular weight of the obtained bromination polystyrene, bromine content, and the measurement result of TG are shown in Table 1.

[0020] (Example 4) In the example 1, bromination polystyrene 419g was obtained by the same approach instead of polystyrene 150g of weight average molecular weight 730 except having used polystyrene 30g of weight average molecular weight 730, and polystyrene 120g of weight average molecular weight 160,000. The weight average molecular weight of the obtained bromination polystyrene, bromine content, and the measurement result of TG are shown in Table 1.

[0021] (Example 5) In the example 1, 401g of bromination objects of a styrene maleic anhydride copolymer was obtained by the same approach instead of the polystyrene of weight average molecular weight 730 except having used the styrene maleic anhydride copolymer (the mole ratio of styrene/maleic anhydride = 3/1) of weight average molecular weight 11000. The weight average molecular weight of the obtained bromination object, bromine content, and the measurement result of TG are shown in Table 1.

[0022]

[Table 1]

表 1

	実施例 1	実施例 2	実施例 3	実施例 4	実施例 5
臭 素 含 有 率            (%)	70.5	69.2	68.1	68.5	61.3
重量平均分子量	1190	11600	17万	13.3万	1.21万
T G    5%重量減少温度 (℃)	304.0	328.5	356.5	346.0	321.0

[0023] The twin screw extruder (KCK 80X2-35VEK(6)) was used after mixing by the combination which shows the evaluation (examples 6-10 and examples 1-3 of comparison) high impact polystyrene (Asahi Chemical make Styron 494 H27), flame retarder, and antimony trioxide (NIHON SEIKO ATOX-S) of the flame retarder in high impact polystyrene in Table 2, and it pelletized by kneading extrusion and the pelletizer with the laying temperature of 200 degrees C. The obtained pellet was fabricated with the cylinder temperature of 200 degrees C, and the die temperature of 40-50 degrees C using the injection molding machine (Japan Steel Works N40-BII), and the test piece was obtained. The following physical-properties trial was performed about the obtained test piece. The test result is shown in Table 3.

[0024] Combustion test: It measured by the approach according to UL94 (1/8 inch).

Heat deflection temperature: JIS K It measured by the approach according to 7207.

Flexural strength: JIS K It measured by the approach according to 7203.

Tensile strength: JIS K It measured by the approach according to 7113.

Izod impact resistance value: JIS K It measured by the approach according to 7110.

(Test-piece configuration: No. 2 test piece A notch [2 No. A])

[0025]

[Table 2]

表 2

	実施例 6	実施例 7	実施例 8	実施例 9	実施例 10	比較例 1	比較例 2	比較例 3
ハイパトリスレン	100	100	100	100	100	100	100	100
難燃剤 実施例 1	3	7	-	-	-	15	-	1
実施例 2	-	-	3	-	-	-	-	-
実施例 3	12	8	12	-	12	-	15	14
実施例 4	-	-	-	15	-	-	-	-
実施例 5	-	-	-	-	3	-	-	-
三酸化アンチモン	9	9	9	9	9	9	9	9

[0026]  
[Table 3]

表 3

	実施例 6	実施例 7	実施例 8	実施例 9	実施例 10	比較例 1	比較例 2	比較例 3
熱変形温度 (℃)	82	80	83	82	82	79	80	80
Izod衝撃値 (kgf・cm/cm <sup>2</sup> )	4.7	4.9	4.6	4.8	4.7	4.0	2.3	3.2
曲げ 強さ (kgf/mm <sup>2</sup> )	5.7	5.5	5.7	5.8	5.6	5.0	4.8	5.0
弾性率 (kgf/mm <sup>2</sup> )	253	254	258	258	255	238	226	248
引張 強さ (kgf/mm <sup>2</sup> )	2.9	2.9	3.0	2.8	2.9	2.4	2.0	2.2
破断伸び (%)	19	17	18	18	19	17	5	10
燃焼試験 UL94 (1/8インチ)	V-0	V-0	V-0	V-0	V-0	V-1	V-2	V-1

[0027] The twin screw extruder (KCK 80X-2-35VEK(5)) was used after combination at the rate of combination of Table 4, and the evaluation (examples 11-15 and examples 4-6 of comparison) ABS plastics (Japan Synthetic Rubber JSR ABS10) of the flame retarder in ABS, the flame retarder, and the antimony trioxide (NIHON SEIKO ATOX-S) were pelletized by kneading extrusion and the pelletizer with the laying temperature of 195 degrees C. The obtained pellet was fabricated with the cylinder temperature of 190 degrees C, and the die temperature of 50-60 degrees C using the injection molding machine (KUROKKUNA F85), and the test piece was obtained. The physical-properties trial was performed with the test method same about the obtained test piece as the above. The test result is shown in Table 5.

[0028]  
[Table 4]

## \* NOTICES \*

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- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.\*\*\*\* shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

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CLAIMS

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[Claim(s)]

[Claim 1] The flame retarder for styrene resin containing the bromination polystyrene of weight average molecular weight 600-30,000, or 90 - 10 % of the weight of bromination polystyrene of 10 - 90 % of the weight of bromination objects of a styrene maleic anhydride copolymer, and weight average molecular weight 100,000-300,000.

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[Translation done.]